

DOCUMENT RESUME

ED 196 673

SE 033 229

AUTHOR Gillmor, Mary S.: And Others
TITLE Animals in the Classroom: A Guide for Teachers.
Elementary Science Study.
INSTITUTION Elementary Science Study, Newton, Mass.
SPONS AGENCY National Science Foundation, Washington, D.C.
REPORT NO ISBN-07-017706-6
PUB DATE 70
NOTE 64p.: Photographs may not reproduce well.

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Animal Facilities: *Animals: Elementary Education:
*Elementary School Science: *Interdisciplinary
Approach: *Science Activities: Science Course
Improvement Projects: Science Education: Science
Programs

ABSTRACT

This guide is designed to encourage people to keep animals of all kinds in the classroom and to use them in teaching language arts, mathematics, and social studies, as well as science and nature study. The booklet is divided into four sections. The first section contains an account of a year with desert animals in an ungraded classroom of six- to eight-year-olds. The second section contains a checklist of things you need to consider for animal care. The third and fourth sections describe methods that have been used successfully in caring for gerbils and two kinds of desert lizards. Some simple, inexpensive cages are described which can be used for lizards and gerbils as well as for other animals. A brief list of books about animals concludes this book. (Author/DS)

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Animals in the Classroom

A Guide for Teachers

Elementary Science Study

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ISBN 07-017706-6

Preface

The Elementary Science Study is one of many curriculum development programs in the fields of science, social studies, and mathematics under preparation at Education Development Center, Inc. EDC (a private nonprofit organization, incorporating the Institute for Educational Innovation and Educational Services Incorporated) began in 1958 to develop new ideas and methods for improving the content and process of education.

ESS has been supported primarily by grants from the National Science Foundation. Development of materials for teaching science from kindergarten through eighth grade started on a small scale in 1960. The work of the project has since involved more than a hundred educators in the conception and design of its units of study. Among the staff have been scientists, engineers, mathematicians, and teachers experienced in working with students of all ages, from kindergarten through college.

Equipment, films, and printed materials are produced with the help of staff specialists, as well as of the film and photography studios, the design laboratory, and the production shops of EDC. At every stage of development, ideas and materials are taken into actual classrooms, where children help shape the form and content of each unit before it is released to schools everywhere.

Acknowledgments

Although many present and former staff members have participated in the development of this booklet, the main contribution came from Jeanne Carritt and Elizabeth Barnett, and from Jane O'Connor and her class. In 1963, Jeanne Carritt visited Jane O'Connor's class, where a unit on animal temperature developed by Charles R. Taylor and Edmond Cabot was being taught. The children's fascination with the animals led Jeanne Carritt to conceive the idea of using this material as an example of an integrated learning experience for primary children. Elizabeth Barnett joined her and Edmond Cabot in observing Jane O'Connor's exciting classroom, in the belief that an anecdotal account of the class could communicate a style of teaching which could be broadly applied. They collected the material for the book, and Elizabeth Barnett wrote the classroom story.

Solution of the problems of keeping the animals healthy in the classroom was subsequently undertaken by Edith H. E. Churchill and Elizabeth Barnett, assisted by other staff, particularly Rhoda Goodell who has kept the animals flourishing in the ESS laboratory. Sally Crissman did further research on the animals and prepared a manuscript. I was then given responsibility for preparing the manuscript for publication. I have re-organized and rewritten the care and feeding sections and edited the classroom story.

The photographs are by George Cope, Joan Hamblin, Edmond Cabot, Dick Lebowitz, and Victor Stokes. Nat Burwash designed the cage shown on page 47, and it is available from the Webster Division of McGraw-Hill Book Company, Manchester Road, Manchester, Missouri 63011. Andrew Littell designed the lamp described on page 49.

Mary S. Gillmor

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A Word to Teachers

ANIMALS IN THE CLASSROOM is designed to encourage people to keep animals of all kinds in schools and to use them in teaching language arts, mathematics, and social studies, as well as science and nature study. While it does contain some information about raising animals, it is not a generalized reference book on animal care. If you need one of these, you will find several listed on pp. 53-54. Pet stores carry pamphlets that give specific information on the care and feeding of various animals you can buy. Zoology texts will give you more information about the animals themselves.

This booklet is divided into four sections. The first is an account of a year with desert animals in an ungraded classroom of six- to eight-year-olds. The second section contains a checklist of things you need to consider, whatever animal you have. The third and fourth sections describe methods that have worked successfully in caring for gerbils and two kinds of desert lizards. Some simple, inexpensive cages are described which can be used for other animals, as well as lizards and gerbils. A brief list of books about animals concludes the booklet.





A Year with a Lively Desert

The First Day

Our classroom life with the living desert began about three weeks after school had gotten under way. This interim enabled the children to get to know me, and I them.

I chose not to prepare the class for the project. One afternoon I simply told the children that when they came in the next day, they were going to have a surprise. Of course they plagued me for clues. And, of course, I told them it wouldn't be a surprise if they knew what it was.

After school that day, I set up the rudiments of the "establishment": two small burrowing cages, with a pocket mouse in each, and a big box. Inside the big box were two desert iguanas and one kangaroo rat. I bought soil and sand, but I did not mix it or pour it into any of the cages. That was left for the kids to do.



The next morning when the children came in, they tore over to the big box and the little cages. They looked in, saw the animals down there—and they were really astonished. They just kind of stood there. Right away I showed them how to go about handling the animals.

I approached one slowly from the front, so the animal could see my hand and get used to it. I picked it up and held it against my body, so that the animal's feet were touching something and it felt safe. The children watched how I handled it with rooted attention. We talked a lot about trying not to squeeze an animal when you held it, even when it tried to get away. Squeezing it very likely would make it become afraid, and it might bite.



I then told the kids that these were desert animals. The kids, in turn, bombarded me with questions:

Where do they come from?

What are they called?

What do they eat?

What do they do?

My reply was that they could find out most of the answers to their questions by themselves. One of their first experiments could be to discover what the animals would eat. I did tell them the names—desert iguana, kangaroo rat, pocket mouse—and I also explained that *Dipsosaurus dorsalis* is the scientific name used by people all over the world for the desert iguana. The children loved the sound of scientific names and used them often.

Then came the sand and soil. I suggested to the children that they try to make a little desert for these animals to live in. I asked them what they thought was needed.

Sand.

Rocks.

Cactus.

Sun.

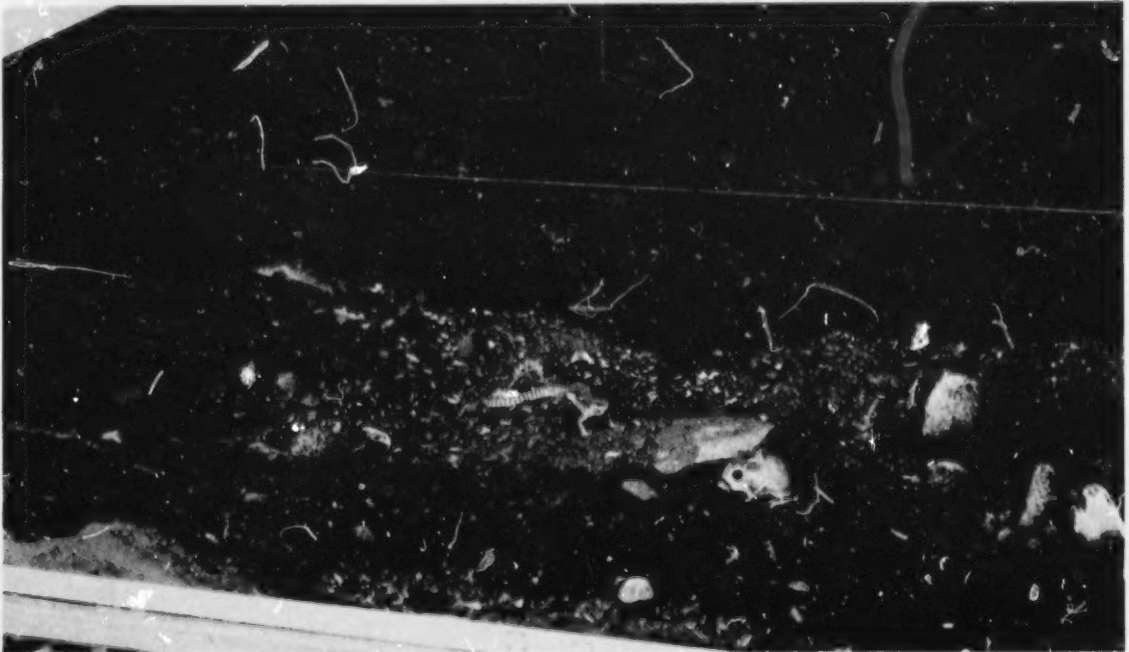
Grass!!

How they loved that dirt and sand! They fought over who would pour it where. It got to the point where I had to limit everybody to five minutes for putting in the soil and packing it down. Finally, the small cages were pretty well filled, and the "desert" had about a foot of soil in it—after the kids had climbed in and jumped all over it to pack it down. They asked lots of questions:

Will grass grow in the desert?

Are there any rocks there?

These questions were left for the children to find out.



The remainder of the day the kids watched the animals. Some drew pictures or made cutouts of them. Almost all of them handled the animals. During the year, no one was ever required to hold an animal. After the first few days, however, it seemed as if everyone wanted to. In fact, from the very beginning there was so much dispute over who was going to get to hold what animal for how long, that the children and I worked out a schedule for "holding" that allowed time for the animals to rest. The fact that everybody realized that at some point during the day he would get to hold one of the animals had a calming effect.

At the end of our first week with the desert, one eight-year-old boy decided, on his own, to record what had happened in our classroom.

LIFE IN THE HOLE

October 7

That evening I, my mother and Mrs. O'Connor entered the big cafe. We discussed the animals and what we were going to get. Mrs. O'Connor said we were getting a Mongolian rodent and a gentle animal that hibernated. Ofcourse I suggested bats.

Some children dug some holes and uncovered tunnels for the Dipsosaurus dorsalis. They rested in them sometimes.

The artificial desert was made up of a lamp to represent the sun, a rock, soil and sand, a stick for a tree, some cactus, a jay plant and some sawdust for the kangaroo rat.

The kangaroo rat came around, and the Dipsosaurus dorsalis jumped at him.

Soon the crimson spectators were throwing ledico at him making him angry. So Mrs. O'Connor put the cage on.

The other names for the Dipsosaurus dorsalis are:

crested lizard
crested iguana
Desert iguana
and alligator lizard

One Dipsosaurus dorsalis made his home between a stone and the sun lamp. The other one made his home on the other side of the mineral. The kangaroo rat lived behind the jay plant and lamp. In between it and the cactus.

The cactus and sand and soil was endless tiretory to them, for the home the class made for them was to them a desert.

THE END

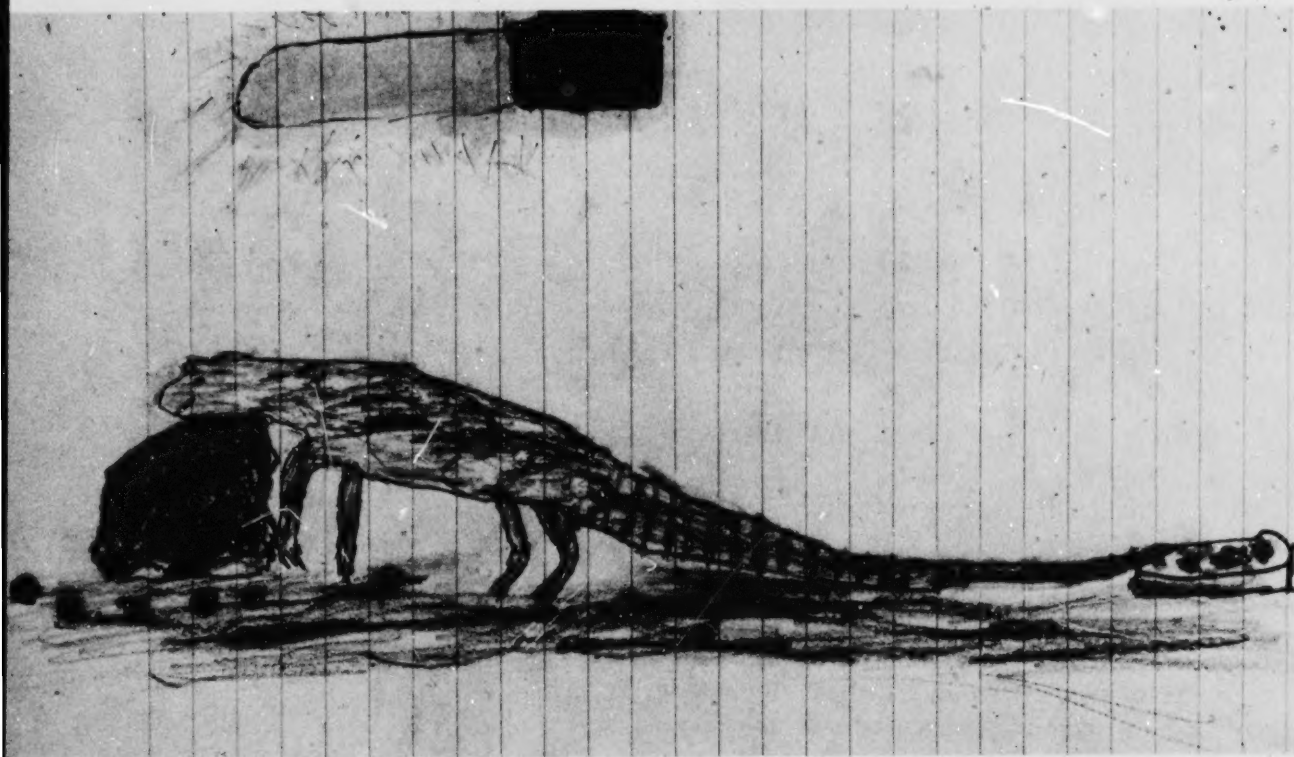
"The Mongolian rodent" turned out to be the gerbil, of course. To avoid havoc in the big box, they resided in a separate, covered aquarium tank filled with dirt, until late in the year, when we switched the animals in the cages and the gerbils became the sole inhabitants of the desert.

Under Way

At the beginning of the year, we often started the day by talking about the animals or planning some activity around the animals and the desert. Sometimes this involved all of the children, sometimes only a few.

I didn't try to focus the children, at first, on anything other than what they were interested in. They were encouraged to go in every direction they could think of. All I wanted them to do for a while was to look, talk, and wonder.

Work with the animals came spontaneously and often. (Scheduling was left for those skills and drills which I felt absolutely *had* to be dealt with.) When a situation arose that had potential, I seized upon it, unless I felt that it should be or *could* be tabled without the children's losing their interest or excitement.



Rules for Taking Care of Our Animals

We had thumbtacked a piece of cardboard across the top of one of the burrowing cages until we could get some wire screening. One day the pocket mouse in that cage pushed his way past the cardboard and escaped. He darted around the room, chased by children who were trying to catch him. The frightened mouse bumped into bookcases and other objects, hurting himself. He later died. The children were very upset.

We had a long discussion about what had happened. We talked about what we should do in the future when emergencies of this kind arose, so that such accidents would not occur again.

One of the outcomes of the discussion was the establishment of an animal-catching committee of four children. They would be the only ones to try to catch an animal if it got out of its cage. They would move very carefully and gently, so as not to frighten the animal. Since almost everyone wanted to be on that committee, we had to change the membership weekly, to give all the kids a turn. I asked the class to think of any rules we needed to help us care for the animals more considerately. They were solemnly given and seemed to meet with approval from everyone.

How Can the Pocket Mouse Live Underground?

Shortly after the death of this pocket mouse, the other one took to his burrow. He wouldn't come up. He couldn't be seen. The children were concerned.

How can he live down there?

He'll suffocate!

They wanted to dig up the dirt in the cage and see if the mouse was all right. I tried to discourage them. I reminded them that this was his home. "Why not let him stay where he wants to be?" A few of the children felt the same way.

The general uneasiness kept building up and spreading. Finally, the children pressured me so much that I

felt their anxiety could only be relieved by my letting them dig up the dirt. We talked about how we could do this without hurting the little mouse that was down at the bottom somewhere.

One girl suggested: "Why don't we dig the way the pocket mouse digs?" She stood up and showed us with her fingers how the pocket mouse dug. We all thought that was a good idea. It took some figuring, but everybody got a chance to dig.

WHY WE DID WHAT WE DID

One day the desert pocket mouse got away, and got hurt. The next day he died. We were very sad. Then Nicky said, "Let's dig up the desert pocket mouse's cage to see if he is alive." So we dug it up and he was alive. The mouse felt like an explosion happened. We found out that he had a back door.

One dissenter, who opposed the digging up, on grounds of cruelty to the mouse, wrote about the incident this way:

After the murder of the pocket mouse we hadn't seen the one who made a house. After a while for some endiotic reason the people worked at the ground till we heard a squeak. He was in a sheltered section.

The incident with the mouse prompted the children to question and explore where other animals make their homes (in trees, water, mud, caves), and the ways man makes use of areas below the ground (tunnels, subways, cellars, and mines). The idea that air is in soil, that air is everywhere, was a staggering one for them.

Animals and Feelings

Getting to know what the animals were like by holding them and playing with them absorbed the children. The need to handle the animals—to be close and private with them—was very important. This manifested itself in many ways.



The pocket mouse, so tiny and to/like, was a great favorite with many of the children. When they held it, they spoke lovingly of it:

Soft.

His claws feel like they're tickling your hand.

Warm.

He's got silk in him.

Fuzzy.

He's cuddly.

Don't let him fall off your desk.

Frisky.

His skin is tender.

He was very wiggly in my hand.

He feels as if he is nibbling you.

Some of their feelings resulted in poetry:

The pocket mouse is
Very small to him
I'm very tall.

And when I carry him
Him around he curls
Up like a ball.

He's brown and
Soft and very
Clean and is hardly
Ever ever mean.

He is my friend
This little mouse
I wish he lived in
My house.

The children became caught up with the idea of working with the animals, of studying them and learning about their habits and where they lived. In their search for information, the children turned, quite naturally, to books. A number of books and magazines about deserts and desert animals were placed around the room and in the library for the kids to look at and read when they pleased—which was often. Considerable time was spent poring over pictures, as well as locating favorite animals and sounding out their unusual names.

What Do the Animals Eat?

Since the children's general impulse was to rely on books for answers to their questions, my emphasis was to urge them to find out as much as they could on their own by watching, thinking, and experimenting. In order for them to do this, there were times when they had to leave the animals alone, in the desert or the small cages, to go about the business of living undisturbed.

Tremendous excitement was displayed by the kids when instead of reading an answer, *they* made a discovery. The question about what the animals would eat led to one of the first experiments.



To begin with, a system had to be devised. Certain people would be responsible for feeding a certain animal at a specific time every day. We drew up a formal record sheet for the date, the name of the animal, the kind of food it was fed, and what it did with the food.

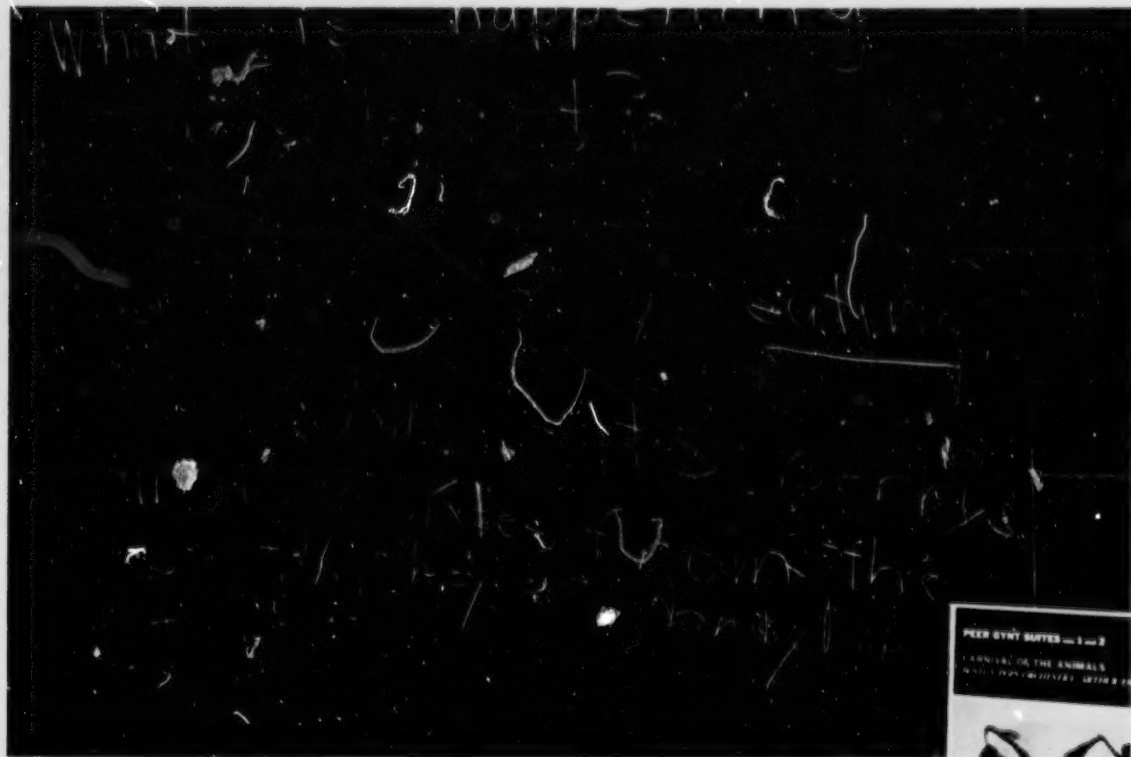
Each of these groups of "feeders" contained one or more seven- and eight-year-olds who acted as reporters. The six-year-olds had not learned to read and could barely write. By dictating their comments and observations to one of the reporters, they were able to participate without getting bogged down in the mechanics of writing. This sharing of skills worked wonders in the ungraded situation. I employed it often. The older children were quite impressed with what the younger ones had to say. At times they were even hard put to it to spell some of the words the sixes came up with.

Everything, from bread and apples to sandwiches and cake, was offered the animals. The records piled up:

Feeding Record

<u>Name of Animal</u>	<u>Kind of Food</u>	<u>What the Animal Did with the Food</u>
<u>Dipsosaurus dorsalis</u>	Bread	Nothing. We will check again by morning.
Desert pocket mouse	Celery	He ate it and his nose wiggled.
Desert pocket mouse	Sunflower seeds	He eats it.
The Kangaroo rat	Lamb chop	Just walked around and he is smelling the food. And he ran away from the food.
<u>Dipsosaurus dorsalis</u>	Lettuce	He layd down on the lettuce.
<u>Gerbils — Meriones</u>	Round cake	They ate some.

Private experiments went on at the side. For example, one day I found that a six-year-old was keeping cabbage in his desk. He was drying it out to see whether the gerbils liked fresh cabbage or dried cabbage best.



Finally, some generalizations were drawn:

*The kangaroo rat and the pocket mouse eat seeds:
pumpkin, sunflower, and bird seeds.*

*The Dipsosaurus does not eat seeds, but will eat
lettuce.*

*The pocket mouse will eat kernel corn, uncooked;
whereas the Dipsosaurus eats cooked corn.*

*The kangaroo rat eats bread. (How does he get
it on the desert?)*

Gerbils love carrots.

Nobody eats lamb chops.

We began keeping a list of scientific terms. The word
"vegetarian" was early on our list, as was "carnivore."

Spring

None of us knew that one of the gerbils was pregnant. Therefore, one Monday morning I was stunned to discover a pile of tiny, hairless, pinkish-brown things squirming in one corner of their cage.



I planted myself outside the classroom door and greeted the children as they arrived: "Don't go into the room. I have news. When everyone is here, let's all go to the gym."

When we reached the gym and everybody was seated on the floor, I began: "I looked at the animals this morning, and when I looked at the gerbils I saw something in the cage that wasn't there on Friday. . . ."

Amid a babble of guesses, came an excited—

Babies!

I gave each person a sheet of paper on which to write "The Gerbils Have Babies" and asked them to write down how they felt upon hearing the news.

THE GERBILS HAVE BABIES!

I felt very Excited!! I am going to tell my mother. And my father too. I am excited! We have to be very, very quiet.

I was excited when I heard that the gerbils had babies. But I did not run around like the other kids. I just smiled.

They bubbled with questions.

How do they look? How do they look?

I asked them to imagine what the babies might look like and gave them drawing paper.

Do they have hair?

"If you think they have hair, put hair on them."

How many are there?

"Draw as many as you think the gerbils might have had."

How big are they?

"Make them the size you think they are."

Did they come from an egg?

"You decide."

Unable to come to a decision, the child who asked this question divided his paper in half and presented two possibilities.

Excitement was high. Ideas flowed.

*Now we can find out when the babies do things—
how old they are, when they crawl,
when they run, when they can dig!*

*What day were they born? I wish they'd been born
when we were here. . . .*

We had two major tasks to accomplish before we returned to the classroom *and* our maternity ward. In light of the newborn gerbils, additional rules had to be established and agreed upon; decisions had to be made as to how and when the children would have the opportunity to see the babies.

A child who had been in a classroom where a mother mouse had eaten her babies related that story. The chastened class discussed why the mother might have done this, and, as one, they agreed that they didn't want our babies to meet the same fate. We would try to make the mother gerbil feel as calm and safe as possible. These were the decisions we came to:

1. Our room was to be quiet at all times. This meant everyone was to whisper.
2. Our room was to be dark.
3. No one was to touch any of the gerbils, or to put his hand into the desert.
4. Only one person at a time could be at the desert.
5. You could not talk while near the desert.

The children drew lots to determine in what order they would get a chance to look at the gerbils. It was decided that each person could spend five minutes watching the babies. We then returned to our classroom.

The bright, sunny room was swiftly converted into a darkened chamber. Children who normally spoke in a roar became inaudible. Happy viewers tiptoed back and forth to the desert. The rest of us wrote and read with our heads inches away from the material. Though the kids were delighted, I wasn't.

"You'll have to think of some other way to make it dark," I whispered.

Ultimately, the way devised was that of covering the entire top of the desert with two large pieces of cardboard. A tiny corner was left uncovered to make sure that air was going in and out and to serve as a peephole. Light streamed into our room again, and as if looking through a microscope, we peered at our gerbil family.



Several of the children suggested putting tissues into the desert to make the babies' nest more comfortable. So as not to disturb the mother and her little ones, they dropped it in on the far side—the same place where they dropped food. Both parents immediately scooted over to where the tissues lay; each took a corner of one piece in its mouth and scampered across the desert to deposit it on the babies. This was repeated until all the tissues were in the nest.

The development of the babies kept the children glued to the big box. They'd watch endlessly, if not pulled away to tend some other task.

A BABY GERBIL'S ADVENTURE

The babies were curious but they couldn't get out of their nest. Finally mother took them one by one to the top of the nest. But they all fell down. Mother took them up again and they wandered off. One little gerbil went straight to his father, but soon got tired of him and wandered away. He wandered all over the desert, climbing hills and falling down again. On falling down a big ditch, he got up slowly and looked disgustedly at the long trudge upward. After a long romp, mother took him and the other two back to the nest for a long nap after an exciting adventure.

Each day I put up a sheet of paper entitled "Gerbils and Babies." Anyone who wanted to write about the gerbils did so whenever he thought about it:

GERBILS AND BABIES

March 15

6 gerbil babies were born. They could not see or hear. With no fur and short tails they felt their way around the nest. The mother and father sit lightly upon them. It takes 9 months for a human mother to get babies, but it takes three weeks for a gerbil mother to get babies.

March 16

The mother left her babies to get some food for them. They squeak. They are light pink. They like to climb on each other a lot.

March 17

They never brush their hair but it is always good looking. Their faces are like the kangaroo rat. They cannot see yet.

Their feet make me think about bird's feet. When the baby gerbils drink milk from their mother they hit her.

March 19

They have a little bit of fur. They are meek and helpless because they are so small and if there were other animals they might eat them.

Comparing the Animals

An awareness was growing of the similarities and differences among the animals we were studying, between desert animals and more common animals such as cats and dogs, between animals in general and human beings.

When the guinea pig in the nursery school had babies around the same time that our gerbils did, the class couldn't wait to see them and compare the litter of guinea pigs with our baby gerbils.

Similarities

1. *There are the same amount of babies.*
2. *The noses look alike.*
3. *Their heads are both flattish.*
4. *They climb on the mother.*

Differences

1. *Their eyes were open when they were born.*
2. *Their ears were open when they were born.*
3. *They pay attention to each other.*
4. *They don't have a nest.*
5. *They are bigger than the baby gerbils.*
6. *They make different sounds.*
7. *The mother likes one child better than the others.*
8. *In two days the guinea pigs were bigger than our gerbils.*



The fact that the *Dipsosaurus* liked to climb the cactus and rest in it prompted the children to examine what kind of skin the lizard had that seemed to make it impervious to the sharp prickles of the plant. They compared its scaly skin with that of the silky pocket mouse, which preferred to sleep in a burrow, and with their own. (The prickles hurt them and remained stuck in their skin.) The "prehistoric" appearance of the chuckwalla (a lizard we added to our colony) reminded some children of pictures and skeletons they had seen of dinosaurs. The possibility that there might be a link between the live animals they watched and handled daily and creatures that had walked the earth millions of years ago stirred their thinking.

The behavior of the animals fascinated the children, too. The chuckwalla could inflate and deflate its body. "When he is scared, he gets fat with air." The children marveled at this. When they found a photograph of a bloated chuckwalla wedged between two rocks, they commented that this was a novel way of defending oneself against an enemy. They considered the other animals. What, if any, provisions were made for their protection? The tawny coloring of the gerbil and kangaroo rat enabled them to blend almost completely into the sand they sat upon.

Observing the lizards at various times, under differing conditions, the children came up with conflicting statements:

The iguana runs very fast.

Iguanas move slowly.

Could it be that they did both? If so, under what circumstances?

Pursuing this question, the children discovered, bit by bit, that there was a relationship between the lamp over the desert being on and the animals' activity. The artificially sunned lizards scooted around the desert like crazy. It was difficult to catch them. People gained status in the class because they were better than others at catching this or that lizard.

Once caught, a lizard would often be taken back to a child's desk, and after a while someone would point out: "Look—he's not running around anymore. See how still he's sitting." When returned to the desert, the lizard invariably sought the warmth of the light.



At night the chuckwalla gets cold and can barely move. In the day he changes color and gets very active. Above 1 hundred and ten degrees they die.

These changes in the lizards opened up even more areas to think about. "Cold-blooded"—the children wrestled with this term when they came across it in a book. They found it a poor one for describing the lizards. At times lizards felt cold, but there were times when they felt warm, too. What did the slowness of the lizards when cold and their speed when warm mean in terms of dealing with enemies and finding food?

The children began to wonder about heat and cold. They felt the sand at various parts of the desert—near the light, away from the light, under rocks, under plants, in burrows. They felt the warmth of the plants and rocks. We talked about relative warmth and compared this warmth with that of the room, the warmth outside the building . . . in the sunlight . . . in the shade.

The children used thermometers to measure temperature everywhere imaginable: in the sun, in the shade, at home, in the desert (with the light on and off), outside and inside, in the morning, at noon, and at night. Though the measurements were inaccurate, the results did make the children aware of how temperatures differ in various places. This, in turn, started them thinking about climate and weather.



The Lizard Ricki

He has small eyes.
His lids close from the bottom up.
His ears are slits.
He has a short tail.
His front legs are shorter than his hind legs.
He has five toes in the front legs.
The legs and arms are jointed.
He has scales on his skin.

When Should We Water the Cactus?

The children's opinions about watering the cactus ranged from never, to sometimes, to a lot. Since no agreement could be reached, a decision was made to write the weatherman, asking him how hot it was on the desert and how often it rained there.

But where was the weather bureau? Animals that had been mailed to us bore the postmark "Tucson, Arizona." The children searched maps to locate the city and state. A committee was appointed to write. The following letter was finally sent off:

Dear Weatherman in Tucson,

We have a fake desert in our room with cactus. We don't know if we should water it a little or a lot. Please tell us if it rains in the desert and how hot it is so we will know what to do.

Love,
The children of Mrs.O'Connor's
class

While we were awaiting the reply, close tabs were kept on local temperatures and weather in the daily newspapers. These were contrasted with TV weather reports about Arizona and with temperature measurements of the desert inside our room.

When the weatherman's answer arrived, the kids were more surprised about how cold it could get on the desert than they were about the intense heat and slight rainfall. As for the cactus, they made up their minds to water it about once a week with a clothes sprinkler, so it wouldn't get too wet.

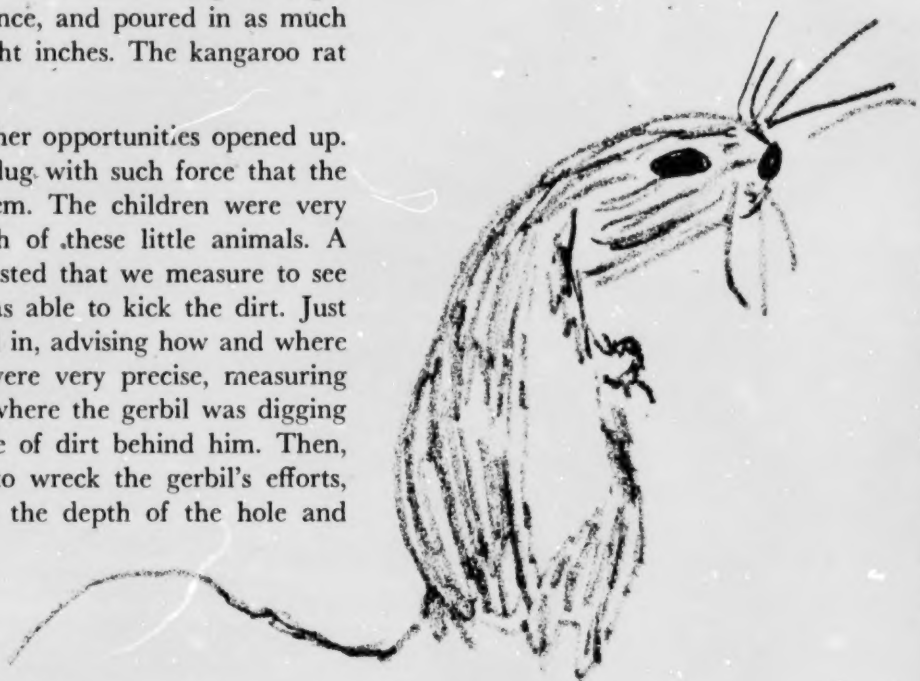
How Much Dirt Should There Be in Our Desert?

The activity of measuring was by no means confined to temperature. From the outset, new situations presented new needs to measure.

The pocket mice in the burrowing cages had dug tunnels all over the place, but the kangaroo rat did nothing. His indifference bothered the children. What was the matter with the kangaroo rat? The kids pondered and questioned until one day a child announced, very excitedly, that he had found some information in a book that said a kangaroo rat would burrow in three feet of soil.

Everyone rushed with rulers to measure the depth of the soil. It was obvious the kangaroo rat had been slighted. He only had three or four inches of soil. They measured the depth of his box. It wasn't high enough. We deliberated, took a chance, and poured in as much dirt as we dared, about eight inches. The kangaroo rat went straight to work.

With the digging, still other opportunities opened up. The gerbils, in particular, dug with such force that the dirt went flying behind them. The children were very impressed with the strength of these little animals. A group of six-year-olds suggested that we measure to see how far back one gerbil was able to kick the dirt. Just about the whole class joined in, advising how and where to go about it. The kids were very precise, measuring from the edge of the hole where the gerbil was digging to the beginning of the pile of dirt behind him. Then, with great care so as not to wreck the gerbil's efforts, they proceeded to measure the depth of the hole and the height of the pile.



Is the Gerbil Growing a New Leg?

The most unexpected and dramatic need to measure resulted from an accident.

One of the gerbils had hurt its foot and had nursed it by licking and gnawing at it, until not only its foot

was gone but a large part of its leg as well. (It appeared to be happy enough, however—eating, running, and digging as usual.)

One day, some weeks later, there was a shout from a group of children who were examining the animal: "The gerbil's growing another leg!"

The rest of the children remonstrated: "That's silly. We can't grow new legs—how can a gerbil?" A rather heated discussion followed. One group was convinced that the leg was longer; the other group was equally convinced that this was impossible. Finally, the children turned to me. "Can a gerbil grow a new leg?"

I answered by asking them, "How can you find out if *this* gerbil is growing a new leg?"

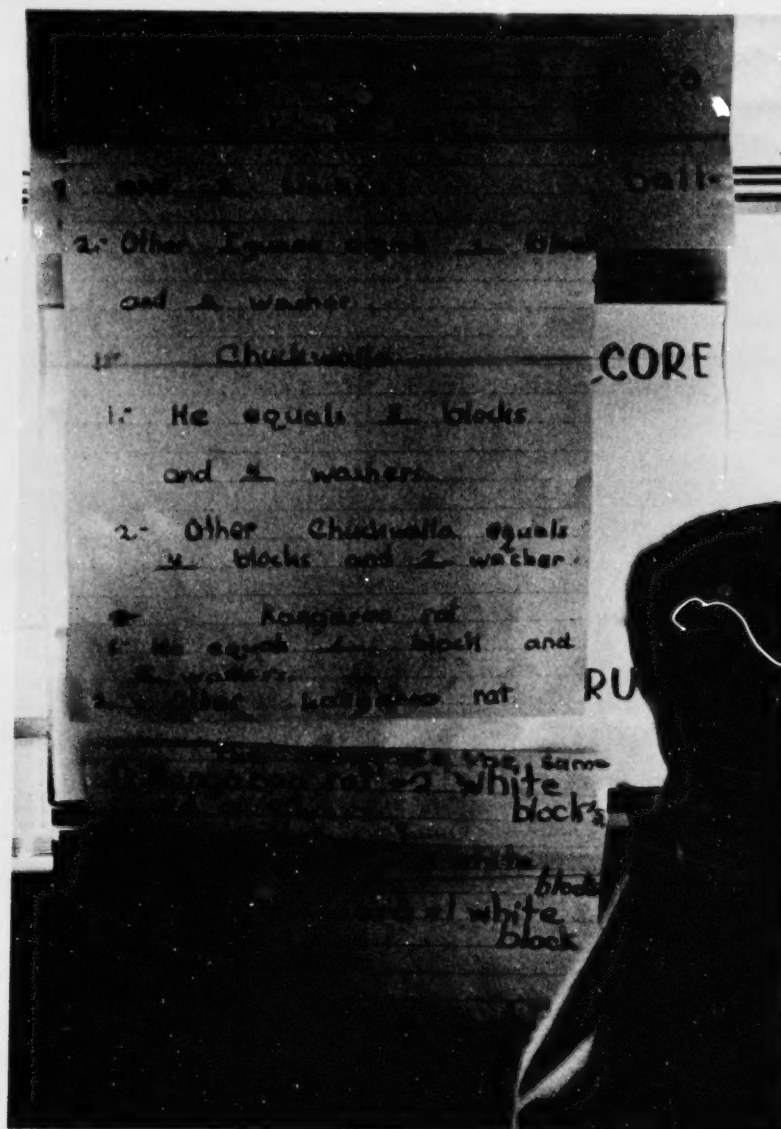
They thought for a while and then someone said: "We could measure it."

The class agreed with this proposal and decided to measure the gerbil's leg every week. The decision sparked a curiosity about other parts of the gerbil. I listed on a chart all the parts the children wished to measure:

What We Want to Measure

- | | |
|----------------------|------------|
| 1. whiskers | 8. height |
| 2. legs--front, hind | 9. nose |
| 3. paws--front, hind | 10. mouth |
| 4. head | 11. tongue |
| 5. tail | 12. teeth |
| 6. ears | 13. length |
| 7. length | |

Two children volunteered to measure the animal, while two others held it still. The four chose to work in the coatroom, where it was quiet and where they would not be interrupted by other children. But they soon came out complaining that it was too hard to measure a wiggling gerbil with a ruler. Someone suggested a tape measure. One was brought to school the next day, and the group went back to work. Their efforts met with only moderate success, but soon other children got involved in weighing the animals.



Animal Arithmetic

Nothing delighted the children so much as getting animals for the classroom or to take home for their very own. Quantity and price became practical realities as we filled out order forms. Dollars and cents were tackled with purpose when presented in the following way:

<u>Dipodomys</u>	<u>merriami</u>	kangaroo	rat
\$2.00	each	for fewer	than six
1.75	each	for more	than six
1.50	each	for more	than twelve

<u>Meriones</u>	gerbils
\$1.50	each if of the same sex
3.00	each if bought in a pair

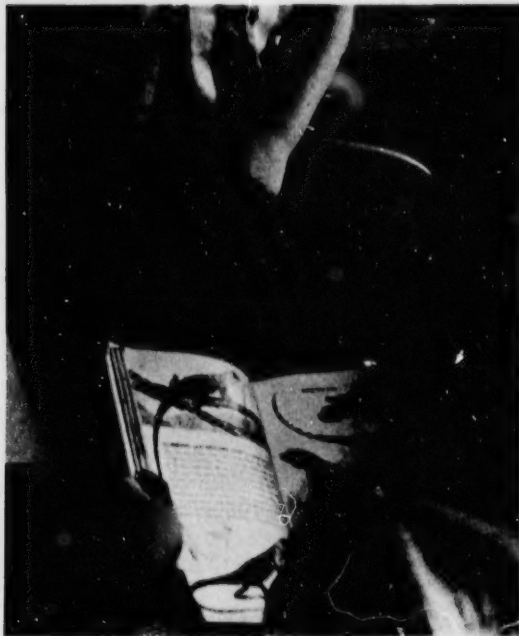
Everyone in the class participated in the ordering, according to his level of ability. In the end, the children were so carried away with the activity that they went on to fill out orders that reached into the thousands.

Words We Need to Know

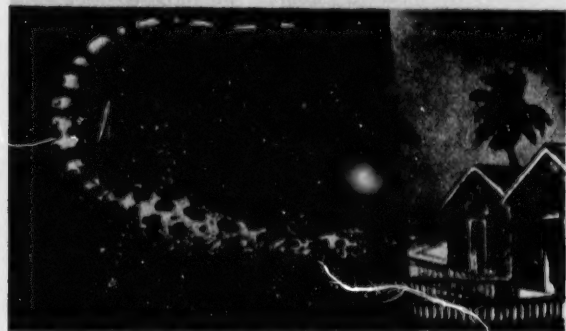
Language . . . communication . . . the understanding and use of words . . . here again the animals worked wonders. The vocabulary connected with them was an entree for the children into an unknown world. "Mammal," "reptile," "lizard," "shed," "flexible," "laboratory," lists of "Words We Need to Know" (in order to write, read, and talk about the project), were tacked up around the room and added to every week or so. The six-year-olds contributed to and learned from these lists as much as anyone in the class. Spelling ceased to be deadly, and the dictionary became a familiar, indispensable book.

One of the favorite books in the class was *Reptiles and Amphibians* by Zim and Smith.* The children actually fought over this little book. They hid copies of it in their desks and were reluctant to give them up. The book was technical, but interest was so high that the children were determined to read it even when the going was difficult.

I decided to take advantage of this interest and use the book's article on geckos—another variety of lizard we added to our desert—with my better readers.



GECKOS are unusually attractive lizards, recognized by their large, often lidless eyes with vertical pupils. The skin, usually covered with fine, beaded scales, is almost transparent. Most have enlarged, padded toes. Geckos live around houses or on trees, feeding on small insects. They are nocturnal. Geckos lay two to three or more small white eggs with brittle shells during summer. Some tropical species have become naturalized in Florida. Geckos are docile and rarely bite. Their tails break off easily. Tubercular and Ground Geckos are our only native species. The Least Gecko probably came to Florida from the West Indies, while the Turkish Gecko originally came from North Africa.



Reprinted and reproduced by permission from *Reptiles and Amphibians* by Herbert S. Zim and Hobart M. Smith, © copyright 1953 by Western Publishing Company, Inc. (Illustrations by James Gordon Irving.)

* See page 53.

When we discussed the words the children had difficulty with, it appeared that "pupils," "scales," and "native" very definitely had more than one meaning. A kind of sifting procedure developed whereby the kids arrived at definitions applicable to the content of the passage they had read. For the advanced readers, this work replaced the reading and language exercises of the basal reader.

At one point the children wanted to take an author to task for writing in his book that pocket mice were not good jumpers. One of our pocket mice had escaped from its cage and leaped around the room. The kids felt such blatant evidence belied the author's statement. "That writer sure hasn't seen *our* pocket mouse."

The animals and the world they lived in ran like a theme through the children's minds and thoughts much of the time. They wrote stories, letters, poems, even songs about them.

The lively desert brought our classroom alive.

Our Desert Animals

5. Pocket Mice

2. Geckos

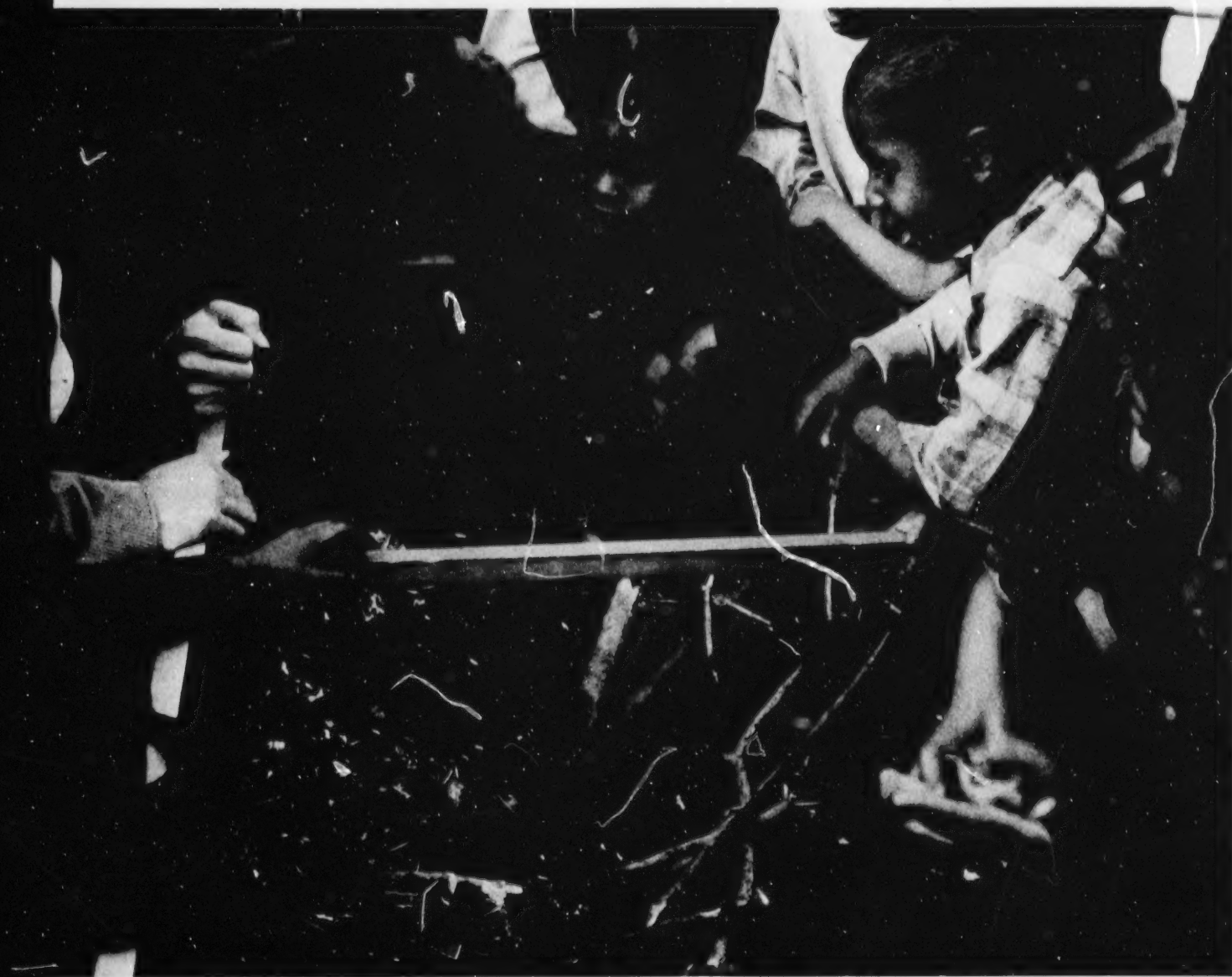
4. Kangaroo Rats

2. Dipodomys Deserti

4. Chuckwallas

4. Gerbils

$$\begin{array}{r}
 + 5 \\
 + 4 \\
 \hline
 9 \\
 + 3 \\
 \hline
 12 \\
 + 2 \\
 \hline
 14 \\
 + 1 \\
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 15
 \end{array}
 \quad = 15$$



Caring for Animals

Animals can be used as a focus for much of the activity in a classroom. Children love them and are usually eager to write or draw about them. Their work with the animals need not be restricted to science class. Imaginative stories, maps, drawings, even arithmetic problems may be inspired by the animals.

You need not limit yourself to the desert animals described in "A Year with a Lively Desert" if you wish to have animals in your classroom. Of those described, only gerbils are readily available in pet stores and easy to care for. The desert lizards can be ordered from some pet suppliers, but their care is somewhat more difficult. (See page 45.) Pocket mice and kangaroo rats cannot be generally recommended for the classroom, since they usually come directly from the wild (that is, they are not raised in the laboratory) and may carry rabies, plague, or other wild-mammal diseases.

Fortunately, almost any animal will do. With very young children, it is best to have animals that are large and friendly enough to be handled without danger to them or their handlers; but even animals that cannot be held, such as tadpoles and brine shrimp, have enchanted children, so take advantage of whatever animals are available.

You should bear in mind, however, that it is your responsibility to see that the animals in your classroom are well cared for and have an environment appropriate to their needs. It is, for example, cruel to let a toad dry up in a glass jar or drown in a tank of water with no land. Animals ordered by mail should be picked up promptly and fed, watered, and placed in comfortable quarters as soon as they arrive. Feeding, watering, and cage-cleaning will have to be attended to regularly. If no one is willing to take on this responsibility, do not have animals in your classroom.

Information on the care and feeding of individual animals is available from many sources. The third and fourth sections of this book give advice on gerbils and two kinds of desert lizards. Pet stores often can tell you about other common mammals, reptiles, birds, and fish. Sometimes a local SPCA, Audubon Society, or veterinarian can help. Several Elementary Science Study units contain care and feeding information about specific animals.*



The best source of all is someone who has previously raised this kind of animal successfully under classroom conditions. The parents, friends, or brothers and sisters of your children may have this kind of firsthand information. Perhaps a high school biology teacher will know.

The important thing is to find out the animal's needs and see that they are met. By doing research on an animal's habits and environment in the wild, you can often figure out what kind of conditions, food, and care it will need in captivity. Your aim should be to approximate, as best you can, the conditions that will allow an animal to continue its natural way of life.

* See *Elementary Science Study units* ANIMAL ACTIVITIES, BRINE SHRIMP, BUTTERFLIES, THE CURIOUS GERBILS, CRAYFISH, EARTH-WORMS, EGGS & TADPOLES, BEHAVIOR OF MEALWORMS, POND WATER. These are available from the Webster Division of McGraw-Hill Book Company, Manchester Road, Manchester, Missouri 63011.

A Checklist for Animal Care

No matter what animals you have in your classroom, remember that each kind has special needs. You will have to find answers to the following questions before bringing in a new animal.

Housing

Land Animals

Do your animals need a cage or can they be let loose in the room?

How large should the cage be?

How high can the animals jump? Should the cage have a cover?

What should the cage be made of?

Do the animals chew?

Does their cage need frequent cleaning?

How small a hole can they escape through?

Do they need soil to burrow in? . . . grasses to nest in? . . . bedding for warmth?

Do they need sticks to climb on or rocks to hide under?

Do they need water for bathing?

Does the cage provide easy access for children?

Should they have an exercise wheel? Do they have enough space?

Is your school sprayed with disinfectants or insecticides? These may kill small animals.

Water Animals

Are they really aquatic animals or are they amphibians (frogs, toads, etc.)? Amphibians need both land and water.

What kind of water will they tolerate? Tap water? Pond water?

How many cubic inches of water does each one need?

Should you have an aerator in the tank?

Food

Do your animals eat other live animals? . . . vegetables? . . . seeds? . . . big pieces? . . . small . . . ?

Will they eat by themselves or will you have to force-feed them?

Will they eat on land, or do they need water to feed in?

Are your animals eating what you give them?
They may be slowly starving to death.

Water

Do your animals need a water supply apart from the water they get in their food?

Will they drink from a dish or a water bottle, or lap water drops off leaves?

Should the air in the cage be humid or dry?

Temperature

Do your animals need a cool place to live or a very hot one?

Handling

Will your animals survive a lot of cuddling by children?

Will the animals bite? Are their bites dangerous?

Time

Do you feel prepared to see that the cages are cleaned as often as necessary and the animals are fed and watered regularly?

Can someone take care of the animals during vacations?

Will both you and the children have time just to sit and watch the animals, to get to know them and to be sure that they are being properly cared for?

Sickness, Injury, or Death

Are you prepared to cope with the possibility of sickness, injury, or death of the animal?

Caring for Gerbils

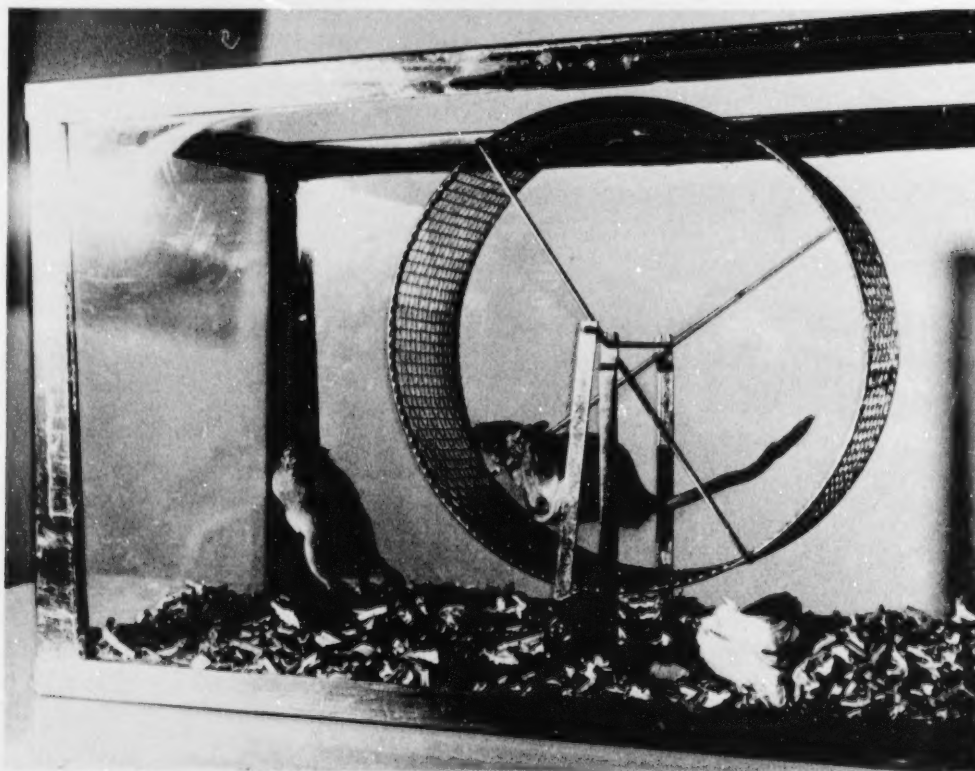
Gerbils (*Meriones unguiculatus*) are small desert animals belonging to a family of rodents that includes the muskrat and the white-footed mouse. They are natives of the arid regions of North Africa, southeast Russia, Asia Minor, and China. Their life span is about three years. Charming active animals, requiring little care, they make ideal classroom pets.* They are available from many pet stores and can be ordered from Tumblebrook Farms, Brant Lake, New York 12815, for \$3.00 each, plus shipping costs.



* See the ESS student book, *THE CURIOUS GERBILS*, available from the Webster Division of McGraw-Hill Book Company, Manchester Road, Manchester, Missouri 63011.

Cages

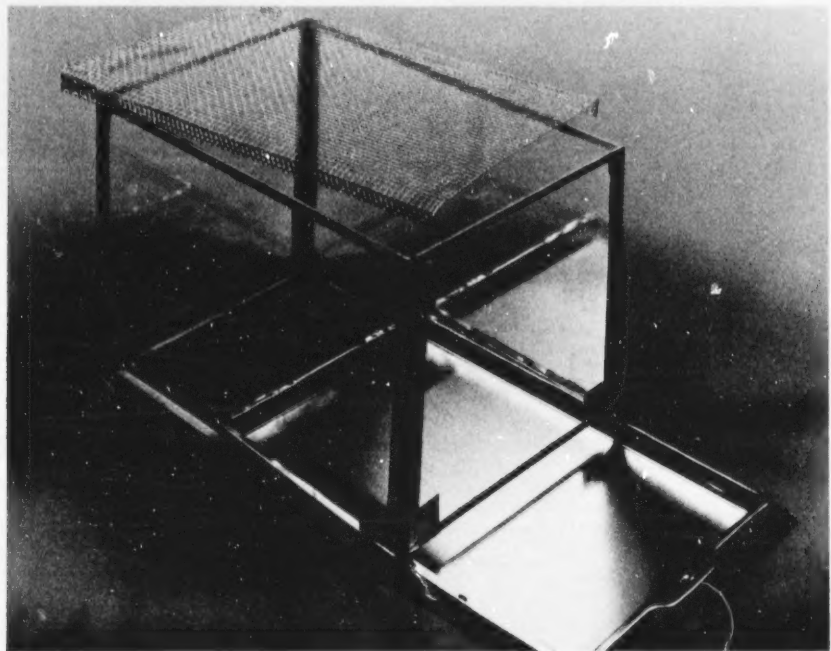
A cage for gerbils should be large and escape-proof. A ten-gallon aquarium tank makes a good-sized cage for an adult pair. (It doesn't matter if the aquarium leaks.) If you don't use an aquarium, it is a good idea to have at least one transparent side to the cage and to keep the cage at a child's eye level, so that the children can watch the animals without disturbing them. It is also helpful to have a cage that opens at the top, so children can reach in and hold the gerbils without taking them out of the cage.



The aquarium must have a top that fits snugly and cannot be knocked off. Screen tops are available in pet stores. Screening ($\frac{1}{4}$ " hardware cloth) can be bought in hardware stores and cut with tin snips to the proper measurement (slightly larger than the top). The edges can be bent down to fit the aquarium exactly. Cover sharp edges with tape, and remember that a gerbil can escape through a remarkably small opening.

If you construct your own cage, remember that:

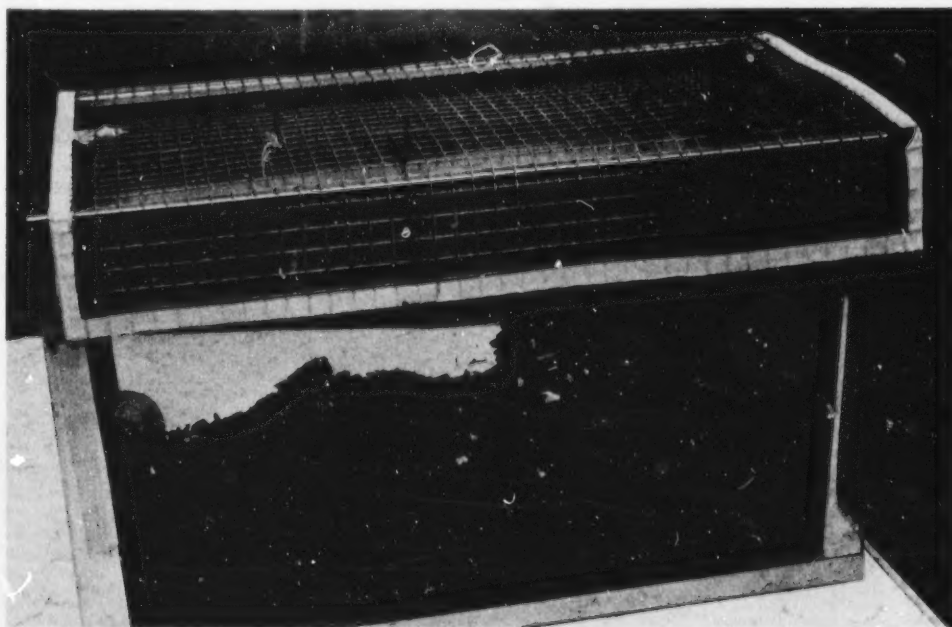
- (a) Gerbils need room to exercise. The cage for a pair should be about $18'' \times 12'' \times 12''$.
- (b) Gerbils gnaw in order to wear down their teeth. The cage should be made of a material they cannot gnaw through. Coarse screening, metal, glass, or other tough material is good. Cardboard and most wood will not last long.
- (c) Gerbils are curious and poke their noses into things. Avoid sharp edges. If you use screening on any part of the cage, make sure the mesh is no bigger than $\frac{1}{4}''$, or a gerbil may get its nose caught in a hole.



An inexpensive cage for a pair of gerbils can be constructed from sheet glass, cloth tape, and $\frac{1}{4}''$ hardware cloth. You will need three pieces of glass $12'' \times 18''$ and two pieces $12'' \times 12''$. Tape the pieces of glass together, and fold the edges of the hardware cloth so it fits snugly. Cover the sharp edges of the hardware cloth with tape. The sliding tray shown in the photo is not necessary for gerbils.

Temperature

In the wild, gerbils live in underground burrows that insulate them against the extremes of temperature found in the desert. In the classroom, it is best to keep gerbils in a place where they will not experience sudden changes of temperature. They can survive temperatures as low as 40°F if they have plenty of bedding to burrow into. If the heat is turned down in your school during the weekend or at night, be sure the animals have an adequate supply of bedding materials. During long vacations, the gerbils should be taken home by you or one of the children.



Bedding and Cleaning

Gerbils are burrowing animals. If you put five or six inches of clean soil on the floor of the cage and then pack it up against one wall (preferably a transparent wall), the gerbils will construct tunnels as they might in the wild. In addition, they should have scraps of cloth or paper or dry grasses for nesting material. The dirt should be kept moist but not wet, since the tunnels will collapse if the dirt dries out. (A laundry sprinkler works well for light watering.) Moist dirt may become

moldy and begin to smell bad after a while. When this happens, you should clean the cage and replace the old soil with fresh soil or another kind of bedding.

Many other bedding materials are satisfactory, though the gerbils won't be able to build tunnels in all of them. Cedar or pine shavings are available at pet stores; two or three inches on the bottom of the cage are adequate. Gerbils will make their own bedding if you give them paper, cloth, or cardboard to shred. Do not use newspaper, however, as it seems to make the cage smell. One family of gerbils made tunnels in large Styrofoam blocks and chewed apart the smaller pieces for bedding.

Gerbil cages should be cleaned only about once a month, since gerbils eat their own droppings which contain essential vitamins. Too frequent cage cleaning can cause a vitamin deficiency in the animals. Since gerbils are adapted to life in a very dry environment, they produce only a drop or two of urine a day and the cage will not get very smelly. Do not let food rot in the cage, however. Remove any uneaten vegetables after a day or two.

Food and Water

In the wild, gerbils eat roots, grasses, seeds, etc. You can feed them rat pellets or Laboratory Chow, available at pet stores. This prepared food provides a balanced diet, but gerbils prefer a more varied menu. If you supplement the basic food with sunflower seeds, corn, dry cereal, apple or melon slices, cookies, etc., the gerbils will eat more and will seem to be happier in general. Do not feed only sunflower seeds if you want babies, however. Although gerbils love these seeds, they are oily and make the gerbils fat. In the female, they may cause a buildup of fat around the ovaries which seems to prevent ovulation.

In the desert, gerbils get all the water they need from the roots and grasses they eat. You should provide them with fresh vegetables, such as lettuce and carrots, at least every other day. (Don't feed them spinach, kale, or cabbage, since these may be poisonous to them.) If

you cannot give them fresh vegetables, hang a water bottle in the cage. Make sure it is working properly before leaving it as the only water source. Do not put an open water dish in the cage, since the gerbils will soon fill it with bedding or tip it over. If the water bottle leaks or water wets the bedding, the gerbils may catch a respiratory infection.

Gerbils will be all right during the weekend if you give them some extra food and fresh vegetables (or a water bottle) on Friday.



Exercise

Gerbils will get adequate exercise trying to burrow into a glass jar or tin can. (Be sure no rough edges are left on the can.) A small exercise wheel in the cage can provide another outlet for gerbil energy. (Keep the wheel oiled to prevent squeaking.) The animals do need entertainment. One of the activities children seem to enjoy most is that of putting different things inside the cage for the gerbils to explore, arrange and rearrange, chew holes in, make nests of, hide in, climb on, etc. Cardboard tubes from rolls of paper towelling or toilet paper make marvelous gerbil tunnels. A bored animal tends to sleep much of the time.

Disease, Injuries, and Parasites

Only a few problems have arisen frequently enough among gerbils kept as pets or classroom animals to be described here. Some gerbils have rubbed their noses raw while burrowing or running on an activity wheel. Wash the area gently, apply a local antiseptic, such as a very weak solution of alcohol and water, and then apply a very small amount of Vaseline.

If a gerbil falls from a high place, it may hurt its leg. If a leg is obviously broken, take the animal to a veterinarian or have it disposed of. (See page 42.) Otherwise, just leave it alone. A sprain will usually heal by itself within a few days.

The furry tuft on a gerbil's tail may come off if it is pulled too hard. The raw end of the tail will bleed a bit and should be treated with an antiseptic, but it will heal.

Very rarely, a gerbil may get mites. If it is scratching itself a lot, hold it over a piece of paper and stroke its hair upward. If there are mites, they will fall to the paper, appearing as very tiny black, white, or red dots.

If you wish, you can almost certainly get rid of mites, but it takes a bit of trouble. You will have to wash out the cage well and dispose of the bedding. Dust the animals with a pyrethrin powder. (Dryone is one common pyrethrin powder used in animal laboratories.) Place them in a clean aquarium or window-glass cage, and ring the top of the cage with Vaseline to prevent the mites from escaping and infecting other animals or the children. This process should be repeated at least twice, at one-week intervals, and children should not handle the animals during this time. Gerbils in a classroom can acquire mites from rats or mice in the school or from someone who handles them. If mites are a recurring problem, you should probably not try to keep gerbils in the classroom and should possibly look into the source of infestation.

If a gerbil begins to behave in a very unusual way, watch it for a few days. If you think it is sick, separate it from other gerbils. If it continues to appear ill, you can either have it examined by an expert or dispose of it.

Like all rodents, gerbils need to gnaw. Their teeth will stay comfortably worn down if you give them paper and cardboard to shred every day. Occasionally, a gerbil's lower teeth will grow upward faster than activity can wear them down. The animal will find eating difficult and will start to lose weight. You may have to dispose of it.

Death

Occasionally a gerbil will die before you are aware that it was ill. Handle it with gloves, and wrap it in a plastic bag before putting it in the trash or burying it. It is important that you remove it quickly to avoid contaminating the other animals.

If you have a sick or badly injured gerbil, it is often most kind to kill it. A simple procedure to use with any small mammal is to put it in a coffee can with a piece of absorbent cotton soaked in household ammonia and close the can tightly. The animal will die in seconds. If you choose not to do this, take the animal to the SPCA or to a veterinarian.

In any case, you should be prepared to discuss death with your class. If you announce a death calmly, most children accept it as natural. Some teachers have said—to young children especially—that most small animals live much shorter lives than ours and may die of old age when we would still be infants.

Bites

Gerbils do occasionally bite people, especially if frightened. If the skin is broken, try to induce bleeding by squeezing the area around the wound. Then wash it thoroughly—with disinfectant soap if possible—and apply an antiseptic and a bandage. Let the school nurse look at the wound if you are worried about it. She may suggest a tetanus shot as a precaution. If a particular gerbil bites a lot, with no apparent provocation, it is not a good animal for the classroom.

Animal bites suggest rabies to many people, but with gerbils there is little cause for worry, since rabies can only be contracted from another rabid animal. Animals purchased from reputable dealers should be in good health, and mammals reared under laboratory conditions for many generations are free of rabies.

Determining the Sex of Gerbils

Telling male and female gerbils apart is extremely difficult until they are at least two months old. Adult gerbils can be distinguished quite easily, however. The male is generally fatter and darker in color around the genitals. The distance from the urinary opening to the anus is longer in males, too.

Introducing New Gerbils into a Cage

Gerbils that have been raised together will usually live very successfully in the same cage, provided, of course, the cage is large enough. Always wash and dry an old cage before putting new animals in it. Otherwise, the smell of the previous inhabitants may cause the new animals to fight. If two strangers are introduced to each other, they should be carefully watched, for they may fight. A new arrival in the cage will evoke a great deal of excitement and activity, and the males may thump their feet threateningly. (They do this at other times as well.)

One teacher reported that if both gerbils' noses are covered with Vaseline when they are first put together, their chances of settling in peacefully are improved. Use a swab or other tool to put on the Vaseline, as the gerbils may bite. The Vaseline will make the fur look rather unkempt for a while, but it will wear off.

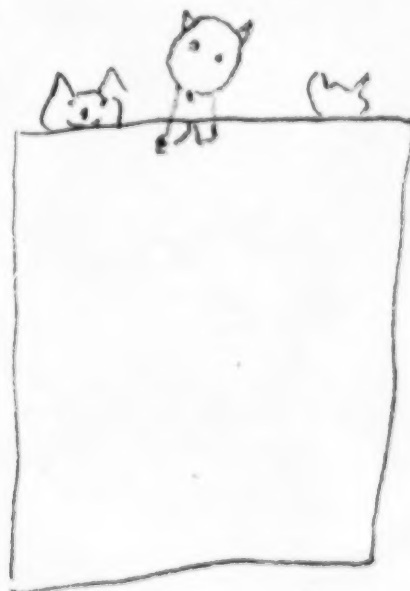
Breeding Gerbils

Gerbils usually breed for the first time before they are a year old, and a female may have as many as ten litters, averaging four or five babies each, during her lifetime. Usually birth is uncomplicated. Try not to disturb the mother and babies any more than necessary until the babies are at least two weeks old. Open the cage only to feed them and change the bedding if necessary, but do not disturb the nest. You may want to add some tissues to the cage for the parents to make a nest with.

As happens with many mammals, gerbils will sometimes eat defective babies. In addition, if the parents have been greatly upset by frequent handling and/or many visitors to the cage, they sometimes eat an entire litter. If they seem very nervous, you may want to cover the cage with an old sheet or newspapers to give the gerbils more privacy.

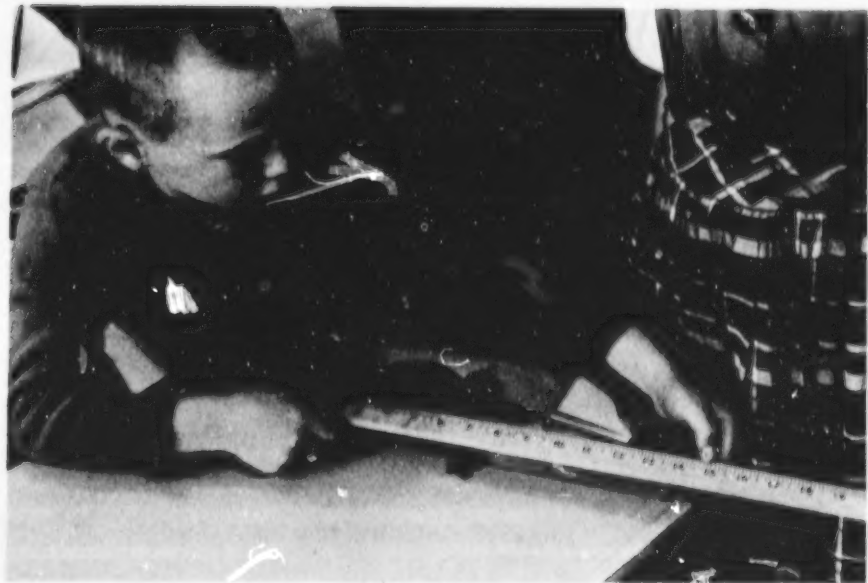
The young are born hairless. Their eyes open at about 21 days, and soon after, they begin to eat solid food. At this point, they can be separated from the parents, though this is not necessary if the cage is very large. Young gerbils do not require special food, though they do seem to enjoy uncooked oatmeal.

The parents may breed as soon as the babies are born, and the gestation period is about 21 days, so you could possibly have new babies every three weeks. Usually they wait at least until the first litter can eat by itself before mating again, however.



Caring for Desert Lizards

The desert iguana (*Dipsosaurus dorsalis*) is a common animal in the desert areas of the southwestern United States and northwestern Mexico. The chuckwalla (*Sauromalus obesus*) is found in the same region as the desert iguana. Neither grows much larger than 18" and, given a proper environment, both have been very successful in the classroom. Both are available, during some parts of the year, from Pet Corral, 4146 Oracle Road, Tucson, Arizona 85705, and other lizard suppliers.



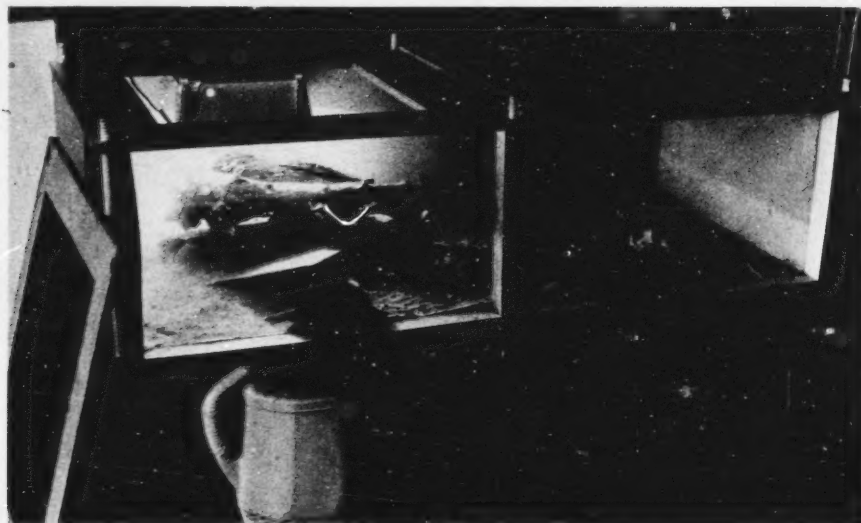


Cages

A chuckwalla and a desert iguana (or several of each) can live together happily. They have adjusted themselves to captivity in cages resembling a desert environment. Keeping gerbils and lizards together in a cage is not recommended, although both are desert animals. Gerbils often chew on the lizards' tails and are apt to move the lizards' landmarks, making them unhappy. Occasionally, however, a teacher has managed to keep lizards and gerbils together in a very large cage without distress. This has the advantage of suggesting a more realistic desert environment to children.

A large wooden box (at least 18" $\times$ 18" $\times$ 24") makes a fine cage for lizards. A ten-gallon aquarium will do for one or two lizards, but the high temperature the lizards need will soften the sealing, and the aquarium will not be waterproof again. An inexpensive cage for two lizards can be made of four pieces of glass or Lucite (2 pieces 18" $\times$ 18", 2 pieces 18" $\times$ 24") with a piece

of Masonite or plywood (18" × 24") for the bottom. Tape all the edges together with cloth tape. (Wood is used for the bottom, rather than glass, because of the weight of this size of cage.) Cover the top with hardware cloth or wire screening. Give the lizards too much space rather than too little. They are happier in a larger cage and are far more active.

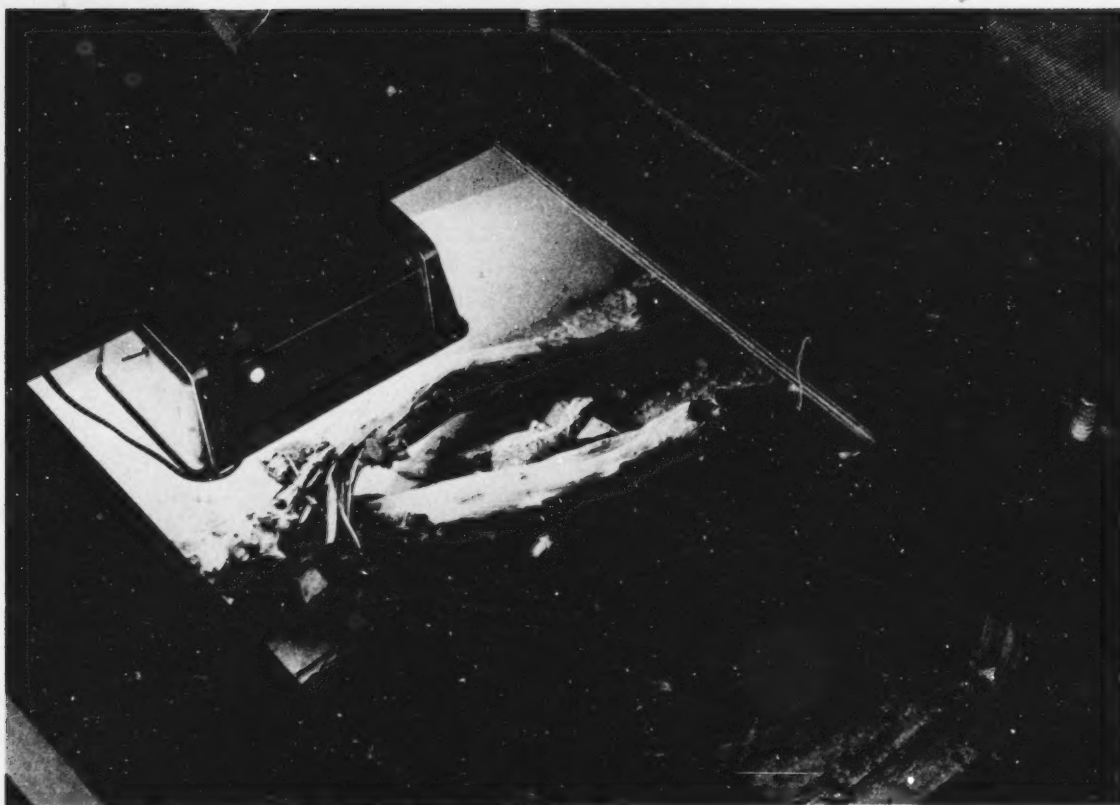


There should be some variety in the terrain (branches and rocks for climbing), but once it is set up and the lizards seem to be established, don't disturb them by moving things around. Lizards become accustomed to certain landmarks and, unlike gerbils, are not very curious.

Bedding and Cleaning

The floor of the cage should be covered with several inches of clean, dry soil or sand. Sand is easier to clean and more like the lizards' natural habitat.

Uneaten food should be removed every day. In addition, the cages should be cleaned completely every three weeks to remove droppings, uneaten food, and any dirt which has begun to mold. Use a piece of screening to sift the droppings from the sand, or use fresh sand.



Temperature

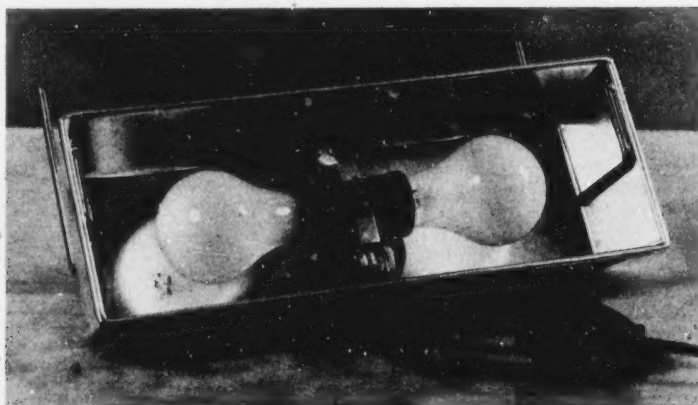
Lizards need both hot and cool areas in the cage, since they cannot regulate their own internal temperature as mammals do. In their natural environment, desert lizards emerge from crevices in the rocks as the day begins and warm themselves until their body temperature rises to about 108°F. They then begin to hunt for food. In order to provide an environment in which a chuckwalla or desert iguana can warm itself enough so that it will begin to eat, you must give them a temperature of at least 110°F in some part of the cage. Without this, they will not eat and will gradually starve to death.

This high temperature can be achieved in a number of ways. The most satisfactory method tested involves two 60-watt bulbs and the construction of a holder for

them out of a bread tin, a double socket (ceramic, if possible), heavy-duty wire, nuts and bolts, and a plug.

This lamp can then be wired inside the top of the cage. A sunlamp can be used, or a gooseneck lamp, but there are several problems: the children, cage, or furniture may get burned; a plastic socket may melt; bulbs may burn out.

Use a thermometer to check the temperature in various parts of the cage for at least a week. Be sure there



are both hot and cool spots. A flat rock propped up on something under the lamp will allow the lizards to get as close to it as they wish. They may use the space under the rock for shade.

You may have to do some experimenting with the temperature in the cage. If your lizards are not eating, try stronger light bulbs. You can also vary the heat by moving the lamp farther away or closer to the sunning rock.

Lizards seem to adjust to a light being on day and night. You may prefer to use an automatic timer that turns the light off for twelve hours at night. You should also take into account the fact that your school probably turns the heat down at night and on weekends. These lizards can survive fairly cold temperatures (40°F) for a day or two, but you should take care that they don't freeze. If you do leave the light on all the time, be sure the lizards have a shaded, dark area as well.

Food and Water

Chuckwallas and desert iguanas should be fed every other day—three times a week, with a little extra on Friday. Both will eat the same kinds of foods. They will survive for quite a while on vegetables alone, but they should be given some kind of live food or its substitute fairly often. Vegetables can include fresh lettuce, celery leaves, and flowers. Chuckwallas, particularly, seem to like red and yellow blossoms, such as dandelions and marigolds. The children might enjoy coloring white flowers with food dye to see whether the lizards prefer one color more than another. The lizards also like fresh fruit, such as sliced oranges, grapes, tomatoes, or melons. Do not feed them spinach, kale, or cabbage, which may be poisonous to the animals.

Mealworms are the most convenient live food available, but they can be expensive as a steady diet. (See page 52 for instructions on raising your own.) Other live insects are also acceptable. Your lizards may adapt to a diet of canned cat food. (The drier varieties work best.) Introduce this on a lettuce leaf. Later they may eat it from a dish.

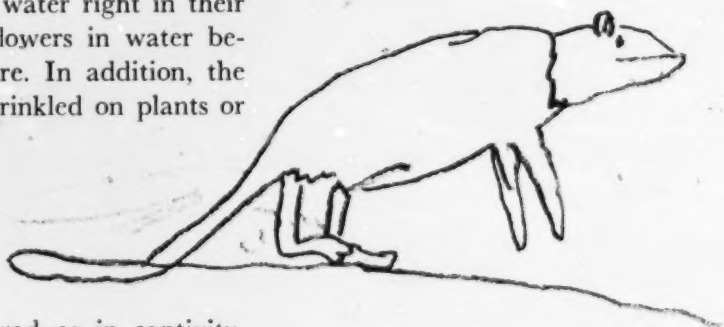
Keep in mind that lizards will only eat if their body temperature is high enough. If the temperature is high and the lizards are still not eating, try other food.

Desert lizards usually get enough water right in their food. Dipping the vegetables and flowers in water before feeding will supply a little more. In addition, the animals may lick up a few drops sprinkled on plants or rocks in the cage.

Breeding Lizards

Desert lizards do not usually reproduce in captivity. Occasionally, however, newly acquired lizards have laid eggs, presumably after breeding in the wild. These eggs often will not hatch, however.

An enterprising class might experiment with keeping lizards under different conditions to try to induce egg laying. They might also try different environments for



hatching the eggs if they are laid. If you are particularly interested in this aspect of lizard life, you may find helpful information in some of the books listed in the Bibliography.

Injury, Disease, and Death

Even with the best of care, lizards occasionally die. Being egg-bound is a common cause of death in recently captured females. (This means the lizard is unable to lay her eggs.) Both sexes are subject to viral and bacterial infections that are not communicable to humans. Bacterial infections often respond to Sulmet (1 tablespoon per $\frac{1}{2}$ cup of water, force-fed with an eyedropper, 1-3 teaspoons a day depending on the size of the lizard) which is available at feed stores or through a veterinarian. Viral infections (causing spasms and shaking) are difficult to cure, and you may want to dispose of the animal. An easy, painless way to kill a sick lizard is to wrap it in a plastic bag and put it in the freezer for 24 hours.

Lizards lose their tails easily, so avoid grabbing them by the tail only. A lost tail will grow back eventually, but it will be shorter. If one of your lizards does lose its tail, wash the exposed end of the body with soap and water, and apply an antiseptic such as 2% gentian violet.

Don't be alarmed if your lizard's skin starts peeling off. Lizards normally shed their skins from time to time.



Raising Mealworms

Mealworms (the larvae of the darkling beetle, *Tenebrio sp.*) are easy to raise and can provide an interesting animal to observe in classrooms as well as a source of live food for lizards and other insect-eating animals.* It does take at least five or six months to get an active colony started, however. Mealworms can be purchased at many pet stores or from biological supply houses such as:

Dix Dock
P.O. 427
West Palm Beach, Florida 33402

Mrs. Eleanor Sylvester
Brockton Worm Hatchery
18a Fuller Street
Brockton, Massachusetts 02401

Carolina Biological Supply
Burlington, North Carolina 27215.

Macalaster Scientific Corporation
60 Arsenal Street
Watertown, Massachusetts 02172

Turttox Biological Supply House
8200 South Hayne Avenue
Chicago, Illinois 60620

You should have at least 100-200 larvae or pupae to start a culture. Most pet stores sell only larvae ("worms"). Place them in a glass, plastic, or metal container, at least 6" × 6" × 6", with a layer of food at least two inches deep. Cover the container loosely with heavy paper or cardboard. The food can be oatmeal, wheatbran, or crushed dogbiscuit. Chicken laying-mash is the ideal food if the mealworms are being raised to feed lizards. It contains more calcium than the other foods and, therefore, makes the mealworms more nutritious. Water is most easily supplied in the form of pulpy vegetables or fruits—carrots, potatoes, apples, etc. Place them uncut on top of the food. Try to avoid getting the food damp, as it will mold. Replace the vegetables whenever they seem dried out.

When the larvae pupate, they should be removed to another container with a small amount of food until the adult beetles emerge. When the adults do emerge, put them back with the main colony. Pupae are isolated to prevent adults and larvae from eating them.

* See the Elementary Science Study unit BEHAVIOR OF MEALWORMS, available from the Webster Division of McGraw-Hill Book Company, Manchester Road, Manchester, Missouri 63011.

The whole colony should be moved to fresh food whenever it smells of ammonia or mold develops. Do not remove many larvae to feed your animals until the colony is well established and all stages (including tiny young larvae) are present. If the colony becomes crowded, some of the larvae should be moved to a new container. Overcrowding will prevent the colony from growing.

An entire life cycle—from egg to larva to pupa to egg-laying adult—takes from five to seven months.

Books About Animals

There are thousands of books about animals, ranging from textbooks to storybooks for young children. Some are illustrated well, some badly, some not at all. A short initial list is provided here.

Information for Teachers

The following three books have been found invaluable, and at least one of them should be available in any school where animals are kept.

Common Native Animals, by M. F. Vessel and E. J. Harrington, Chandler Publishing Co., San Francisco, California, 1961.

Keeping Animals in the Classroom, by Verne N. Rockcastle, Cornell Science Leaflet, Vol. 53, #1, Ithaca, New York, 1959.

Adventuring in Nature, by Betty Price, National Recreation Association, 8 West 8th Street, New York, New York, 1963.

Reference for Both Teachers and Children

The Golden Nature Guides, *Reptiles and Amphibians*, *Mammals*, *Insects*, *Fish*, and others by H. S. Zim et al, published by the Golden Press, New York, are available in paperback, have been most sought after by

children, and are strongly recommended. Young children like to look things up in these books. They are easy to use and well illustrated in color, and the information is concise, although usually too difficult for the youngest children to read.

General Reading

The Burgess animal books are old standbys. Rachel Carson's *A Sense of Wonder* and Henry B. Kane's series, *The Tale of a Pond*, . . . *a Meadow*, . . . *a Wood*, are beautifully illustrated. E. B. White's *Charlotte's Web* is a well-known classic, as are Kipling's *Jungle Books* and *Just So Stories*.

The current output of children's books about animals and nature is voluminous. Much of the material is excellent. You are best qualified to select what suits the age and needs of your students.

Useful References

Clemons, Elizabeth: *Tide Pools and Beaches*, Alfred A. Knopf, Inc., New York, 1964.

Written for children; about observing and collecting at the seashore.

Moore, Clifford B.: *The Book of Wild Pets*, Charles T. Branford Co., Newton, Mass., 1954.

Well illustrated and informative. Contains practical suggestions and diagrams for constructing cages and setting up woodland, marsh, and desert terraria.

Reynolds, Christopher: *Small Creatures in My Garden*, Farrar, Straus & Giroux, Inc., New York, 1966.

A book for children about how and where to find some of the most common animals, chiefly insects.

Shuttlesworth, Dorothy E.: *Exploring Nature with Your Child*, Hawthorn Books, Inc., New York, 1952.

A good source book about collecting animals that are suitable for young children.

Our Twelve Days of Christmas

